ANTARCTICA

The Ice Sheet, Land,
And Coastal Ocean
From RADARSAT -1

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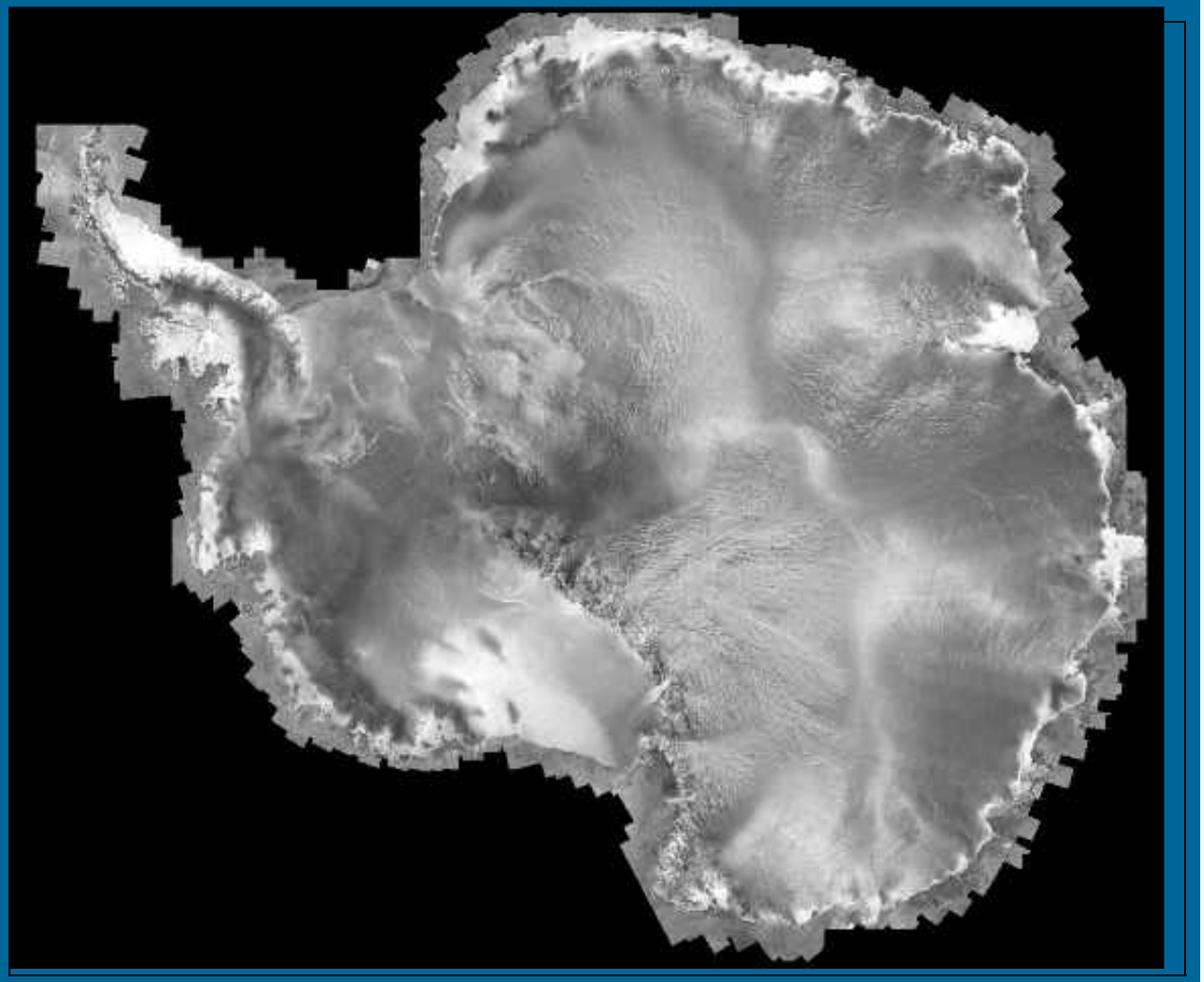
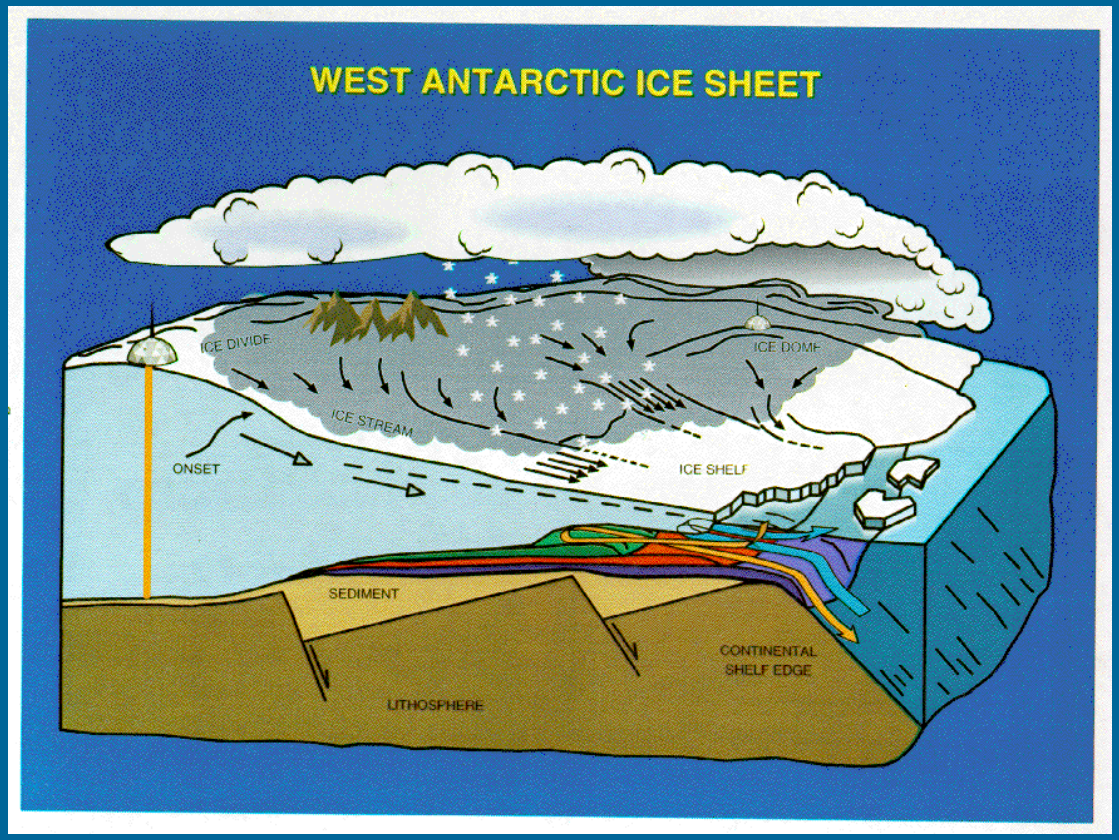


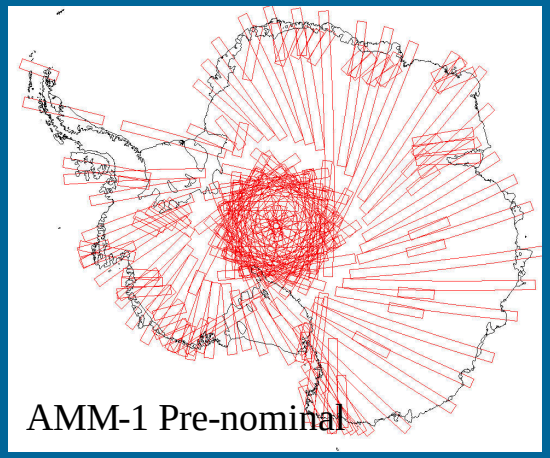
Reservoirs of Fresh Water



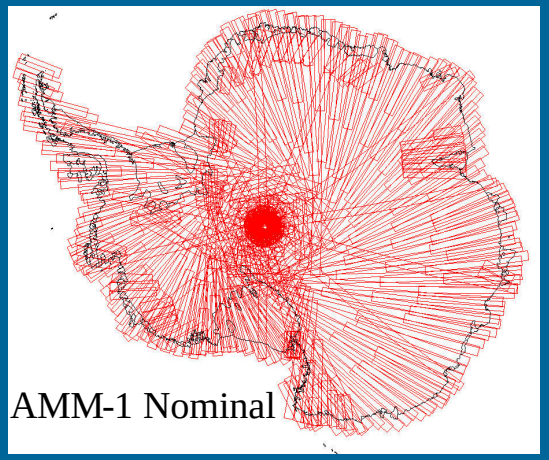
Distribution of Fresh Water

Polar Ice Sheets and Glaciers 77%

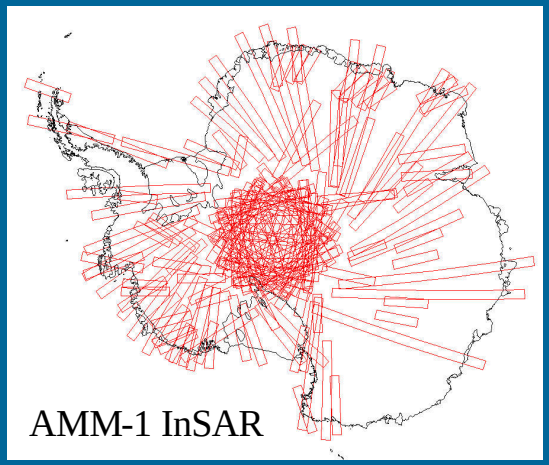
E Ant 80 %
W Ant 11
Grnlnd 8
Glaciers 1



AMM-1 Pre-nominal



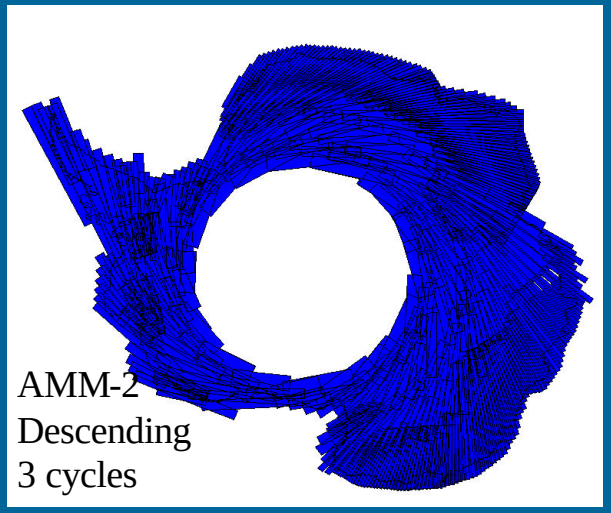
AMM-1 Nominal



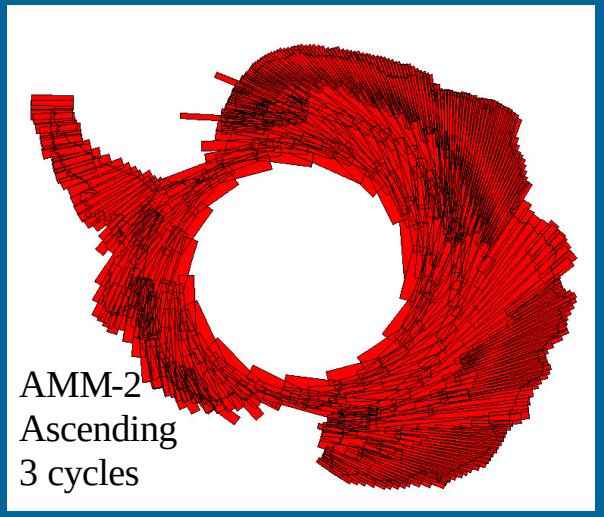
AMM-1 InSAR

RAMP designed to:

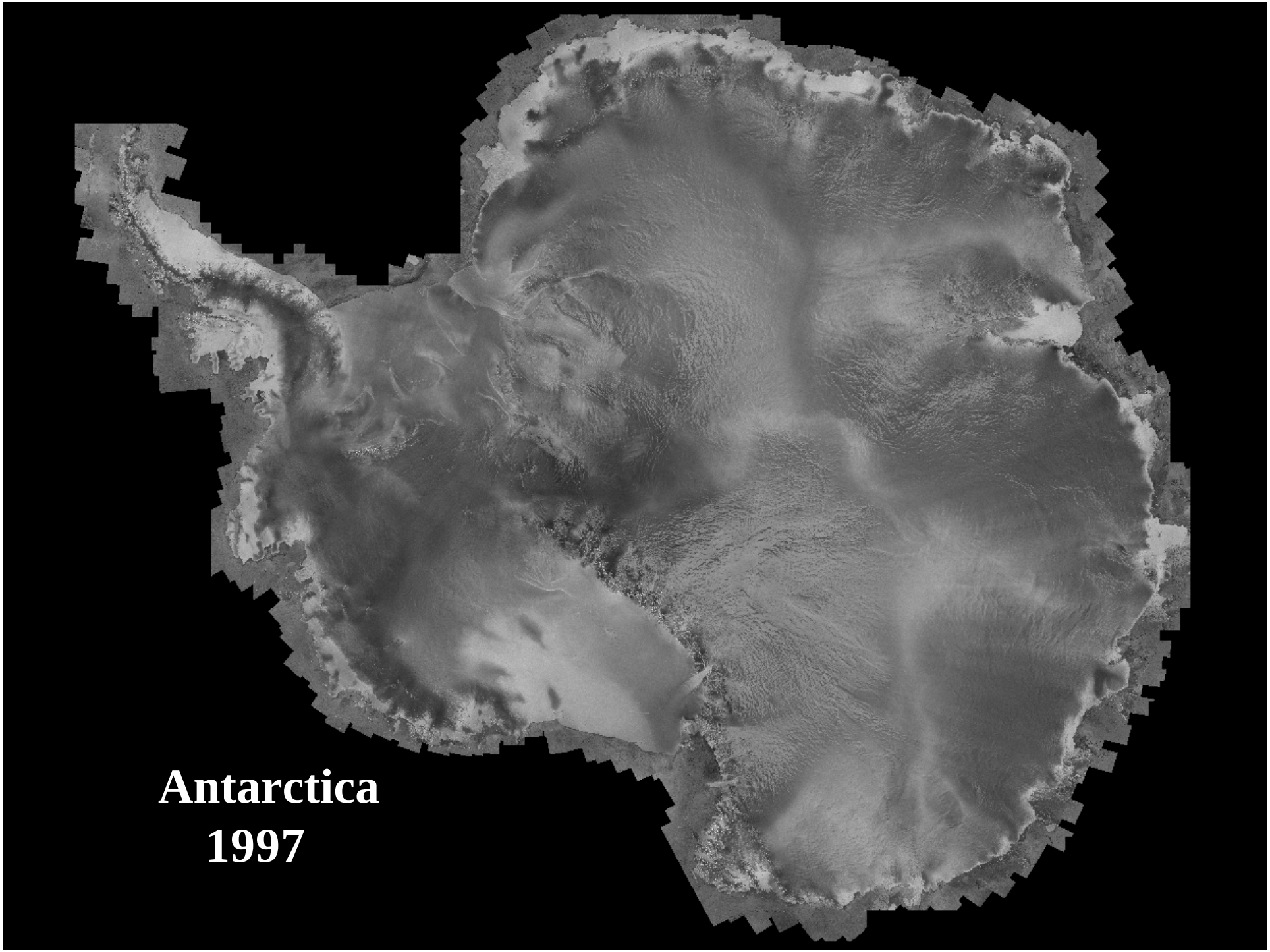
1) study ice sheet structure and extent
2) measure ice sheet surface velocity and study ice sheet dynamics
3) Establish benchmarks for assessing changes in ice sheet extent, dynamics and interaction with the coastal environment



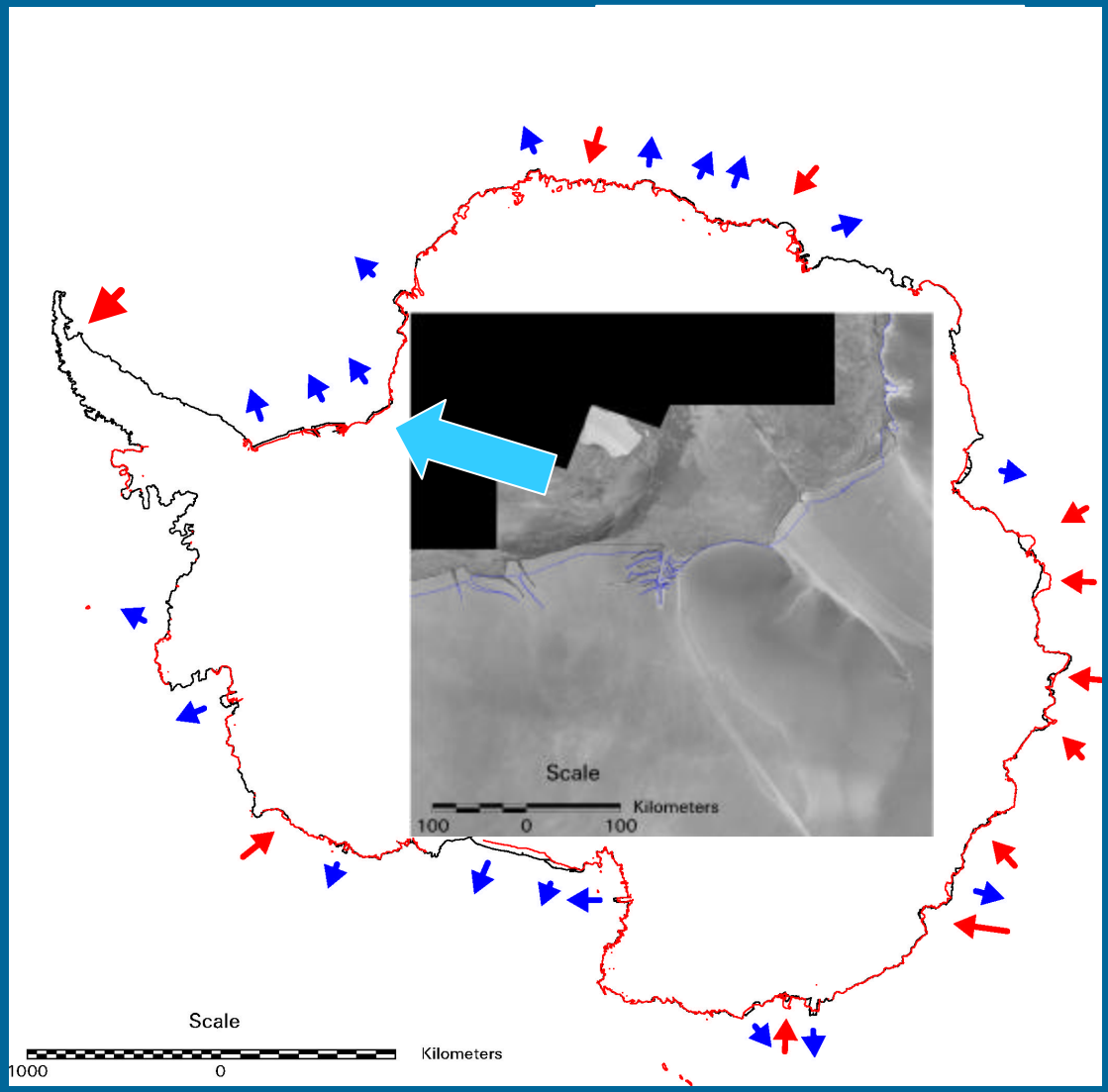
AMM-2
Descending
3 cycles



AMM-2
Ascending
3 cycles


Antarctica
1997

Ice Margin Change



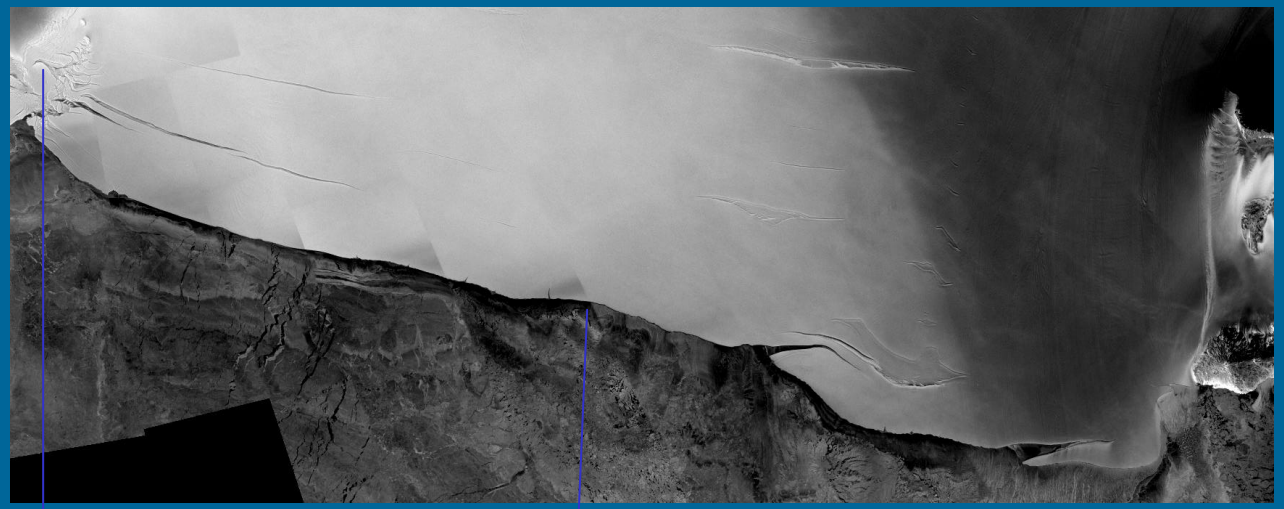
Measuring the position of the ice margin over time is the simplest way to see where the ice sheet is growing or shrinking - but it is not always simple to understand whether observed changes are due to external forcings such as climate, or internal changes in ice sheet dynamics

RADARSAT-1 (black) and ADD coastlines (red). Arrows identify displacements greater than 10 km .

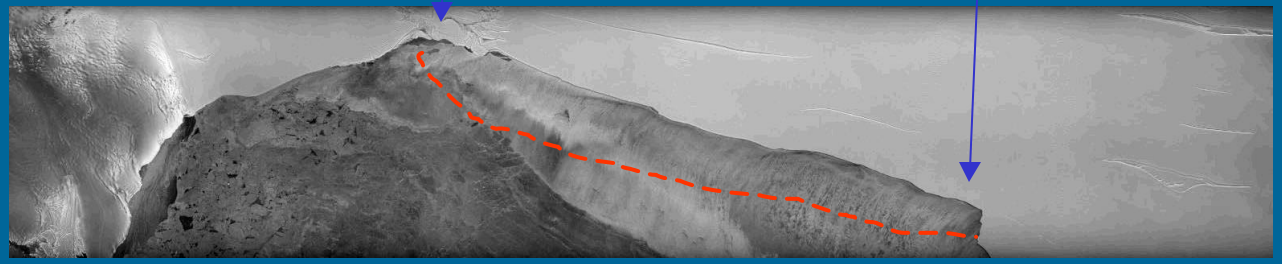
Antarctic Tabular Icebergs and Change Detection

In March, 2000, one of the largest icebergs ever to be observed broke away from the Ross Ice Shelf. These Radarsat images from September 1997 and September 2000 capture consequences of the event. High resolution Radarsat images are being studied to understand the physical mechanisms that trigger iceberg formation.

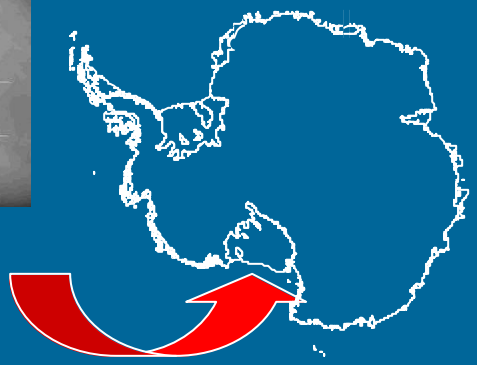
September, 1997

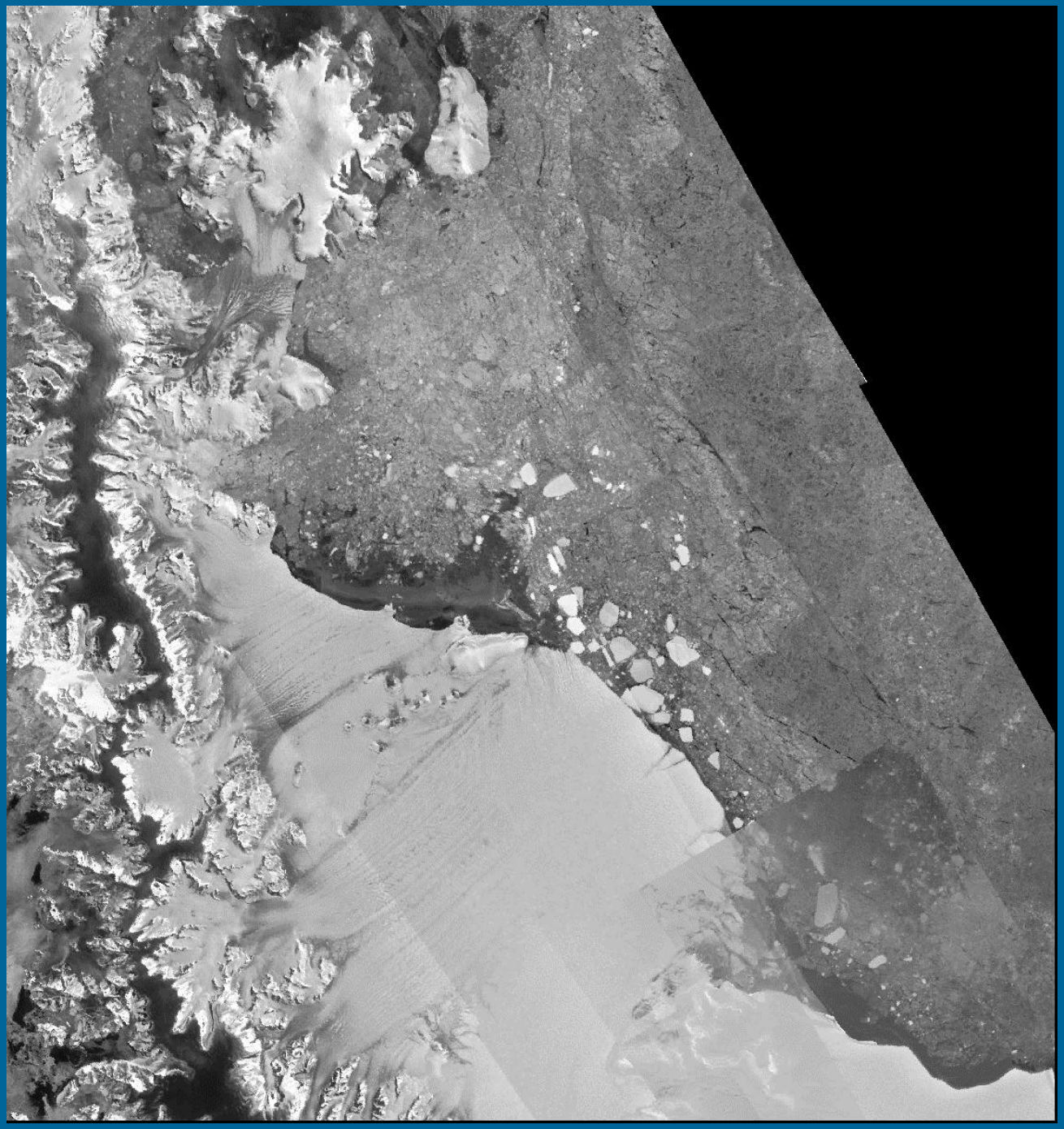


100 km



September, 2000



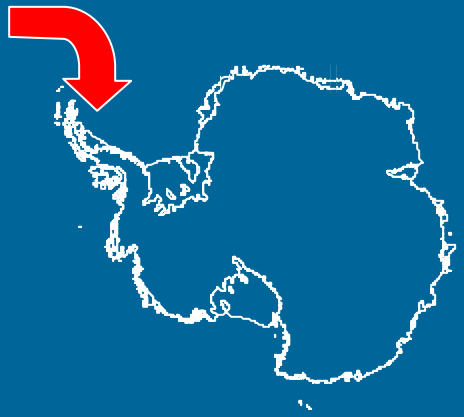


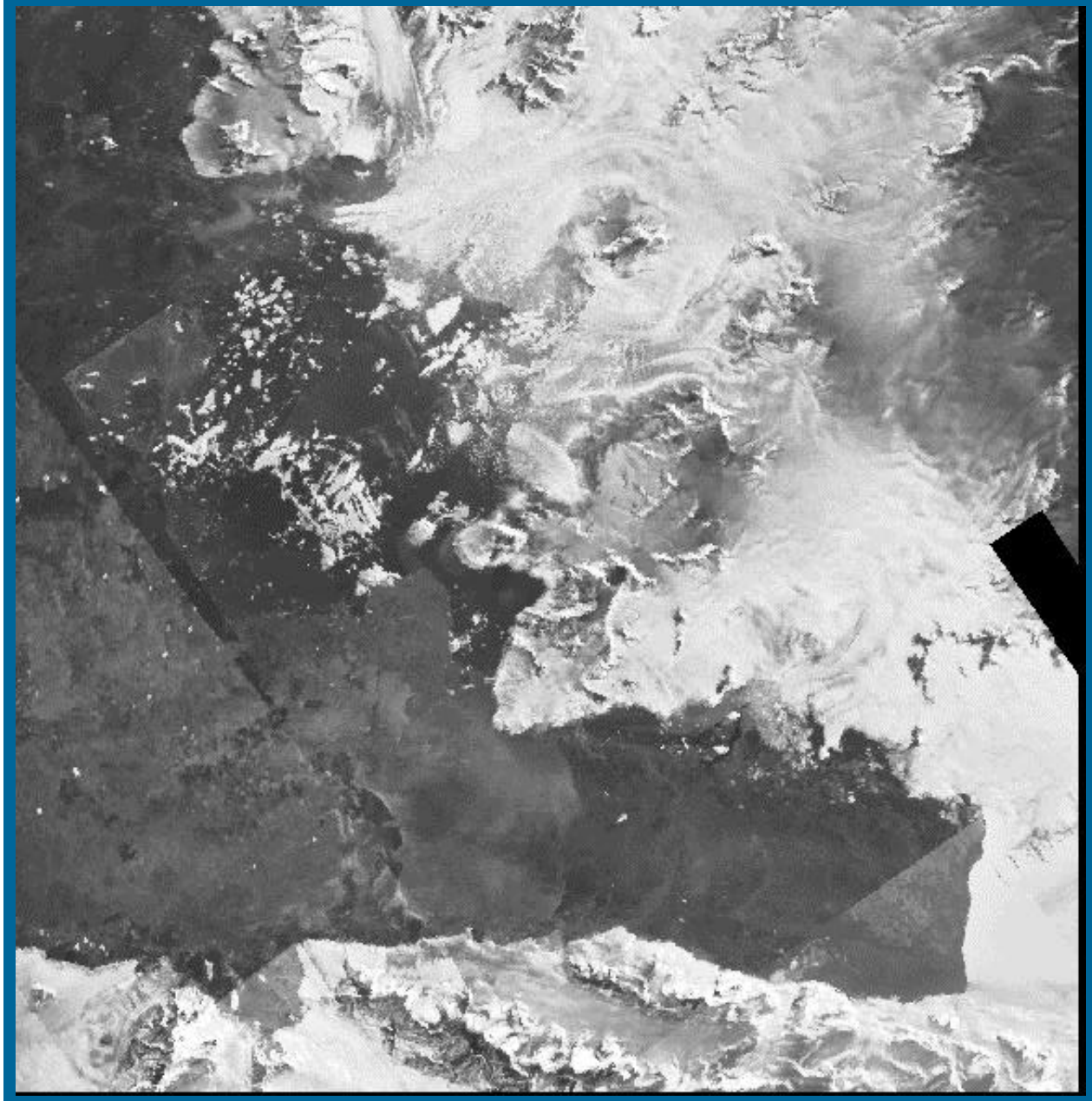
Larsen Ice Shelf

In 1978, John Mercer predicted that the collapse of Antarctic Peninsula Ice Shelves would be a precursor signal of global warming. Antarctic Mapping data are being used to investigate whether the behaviors of Peninsula ice shelves are a local phenomenon or a hemispheric signal.

(1992 ERS-1,
1997 RADARSAT, 2000 RADARSAT)

(click image for animation)



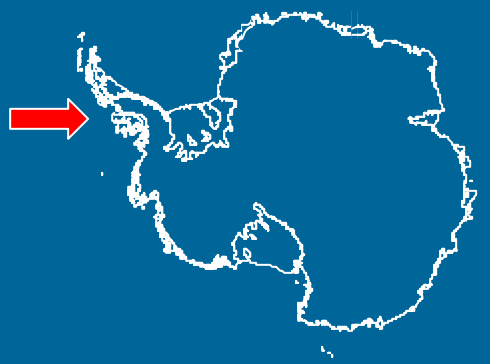


(click image for animation)

Wordie Ice Shelf

The Wordie Ice Shelf began retreating in the early 1970's. Of note here is the small glacier just north of Cape Jeremy. It is seen to advance 7 km into Wordie Bay from 1992-97. It then abruptly retreats.

(click image for animation)

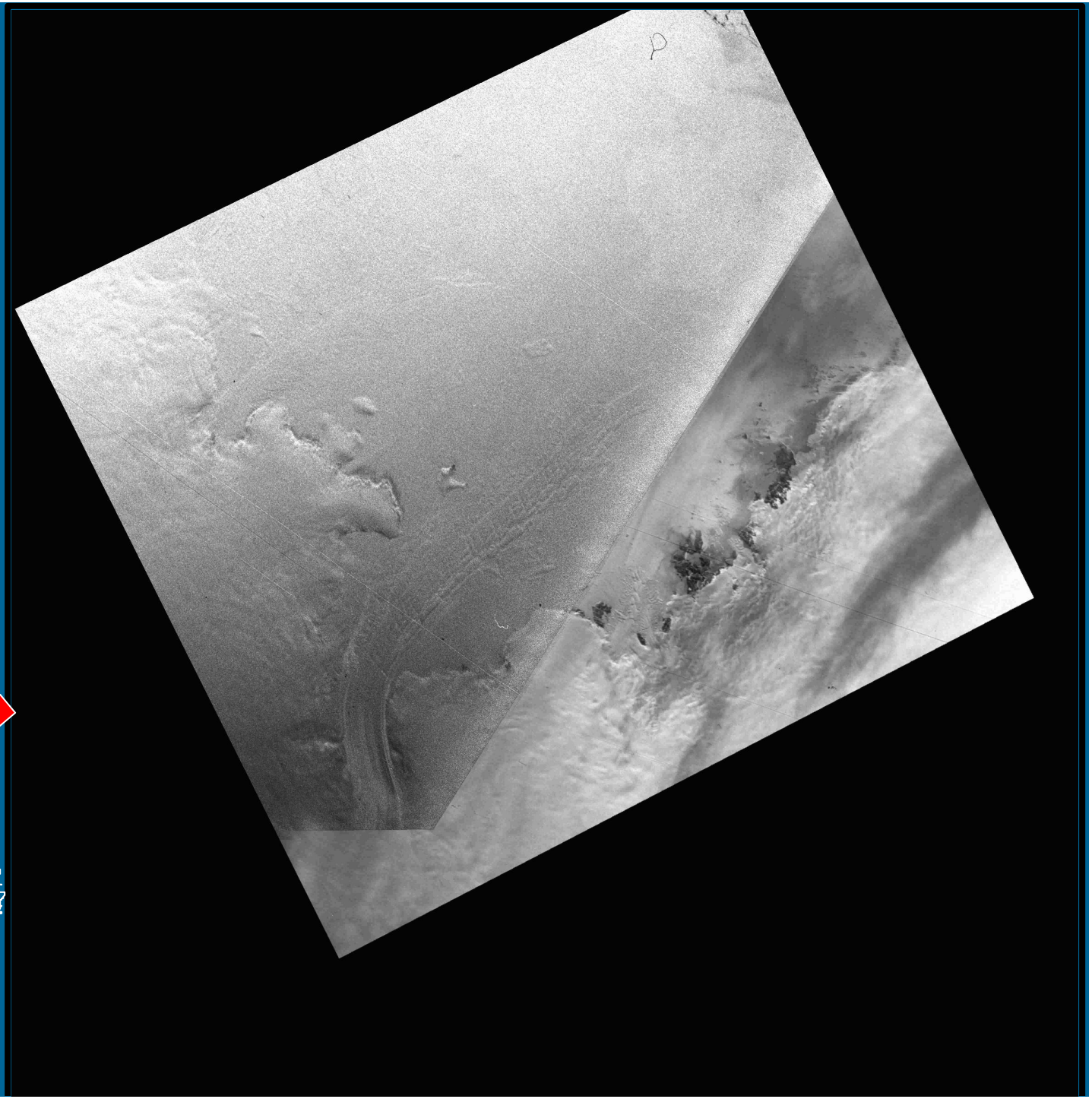


Shirase Glacier

One of Antarctica's fastest outlet glacier, the Shirase Glacier ice tongue has advanced and retreated into Lutzow-Holm Bay.

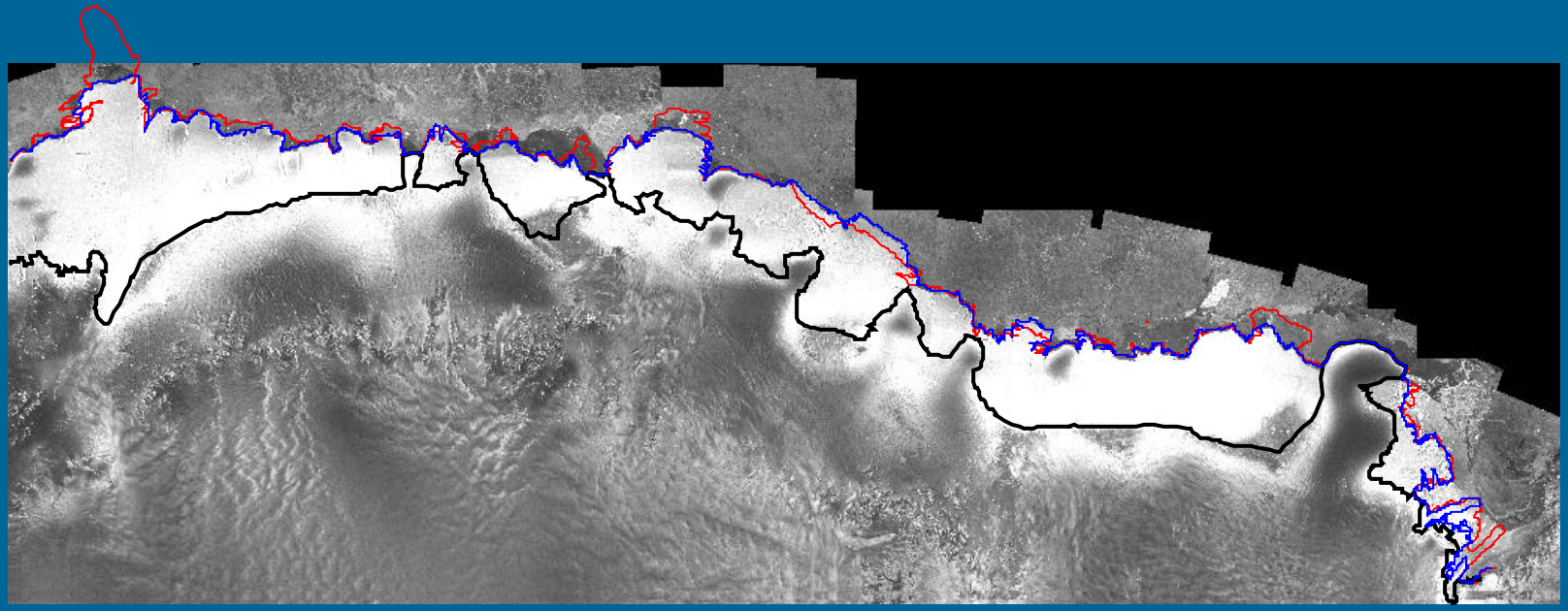
1963 DISP
1988 LANDSAT
1997 RADARSAT
2000 RADARSAT

(click image for animation)



Queen Maud Land Coastline and Ground line

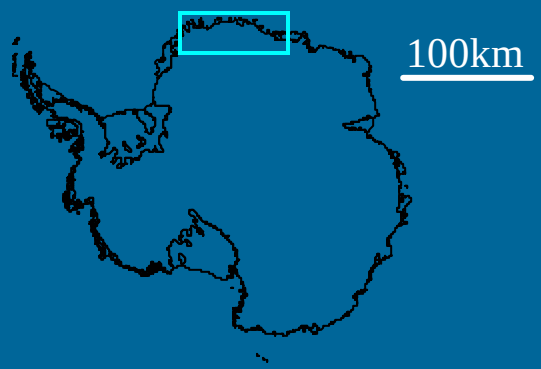
Ice margins retreated from 1963 to the mid-1970's. But since then, the margin positions have stabilized, and are predicted to remain so for several hundred years at least.



1963 Ice margin
1997 Ice margin
1997 Ground line

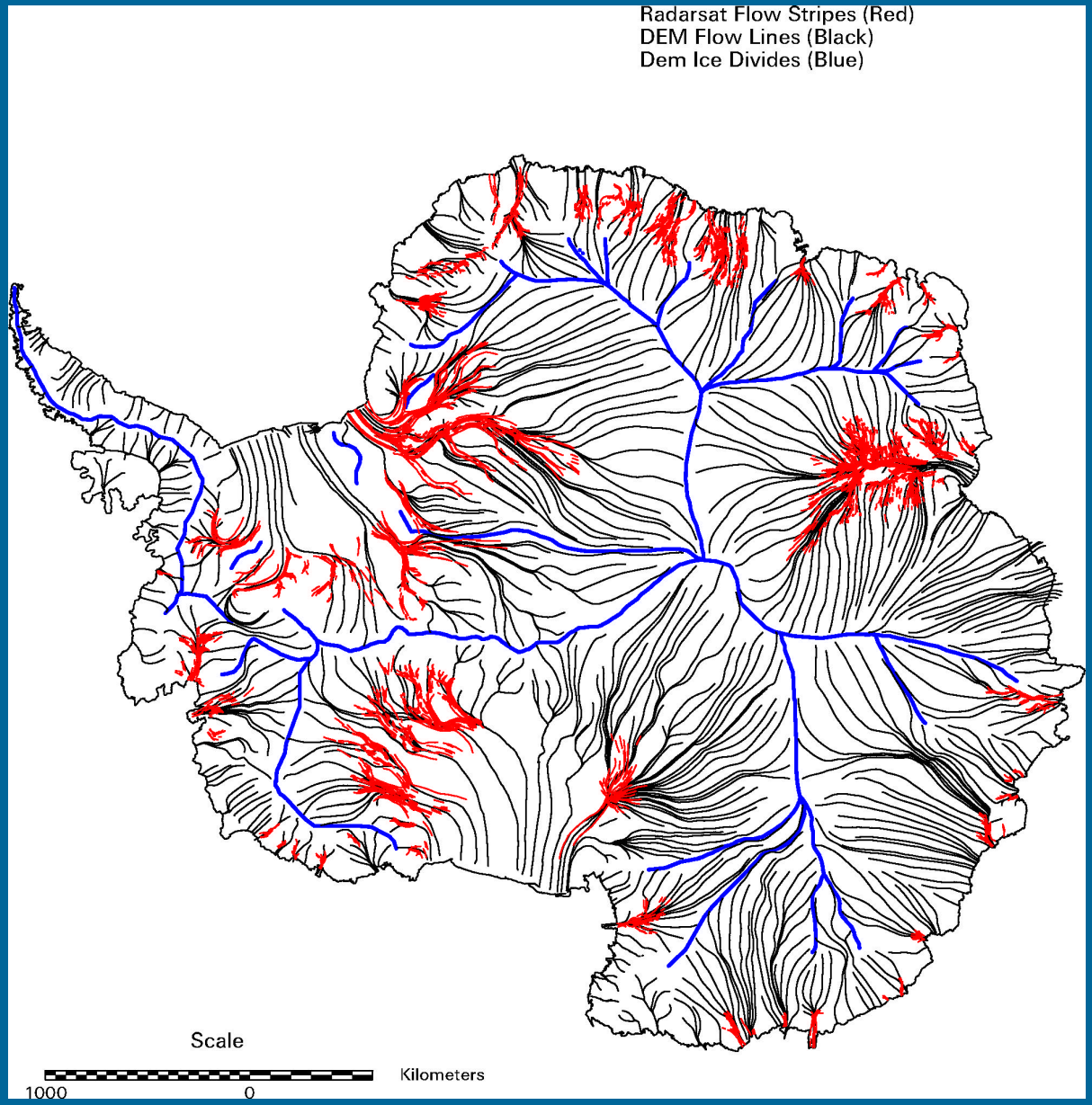
Retreat (8.2%) 11,183 km^2

Advance (2.4%) 3.307 km^2



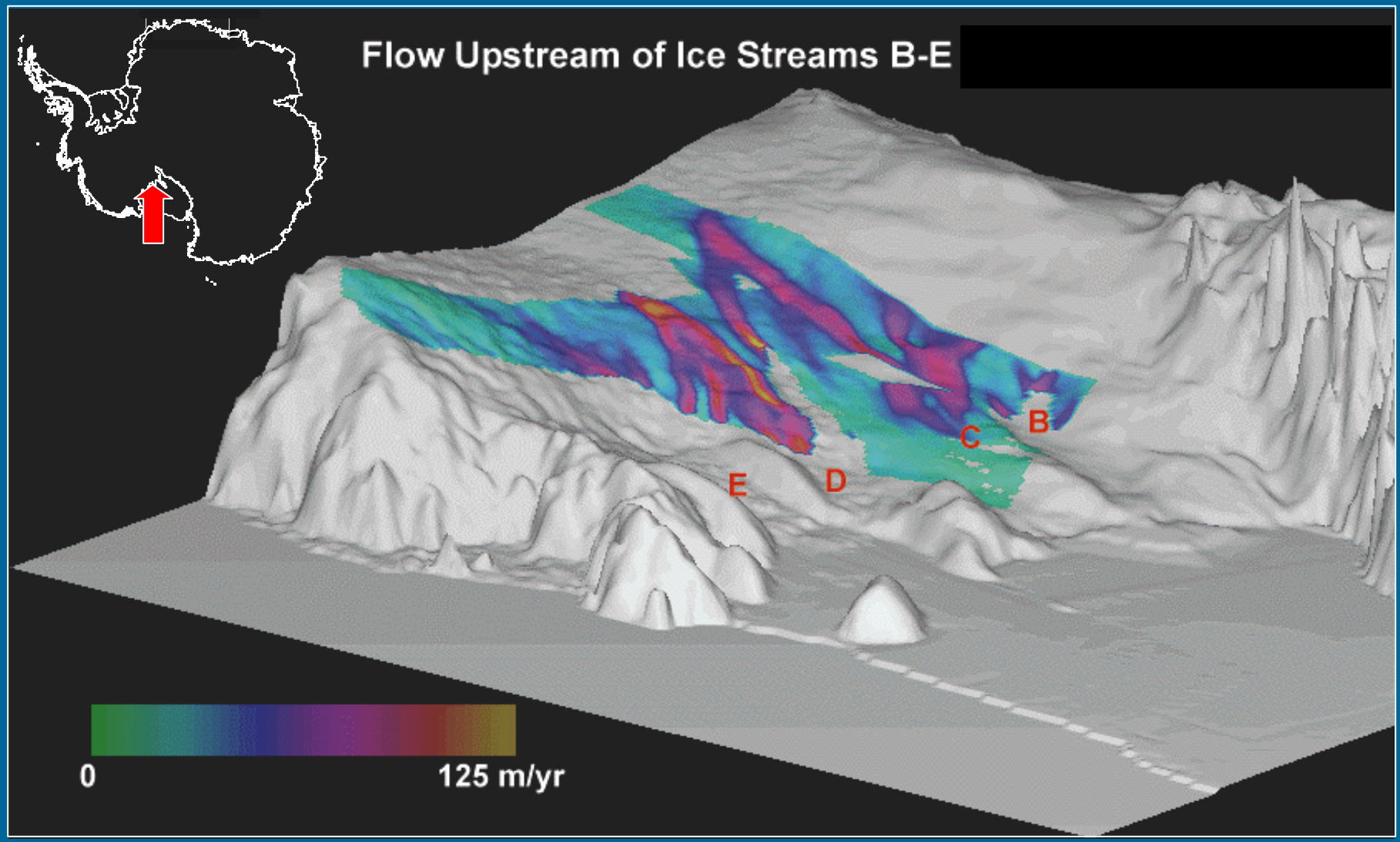
Antarctic Ice Dynamics

Ice Stream flow stripes from RADARSAT, ice divides and flow lines (from OSU DEM - above).



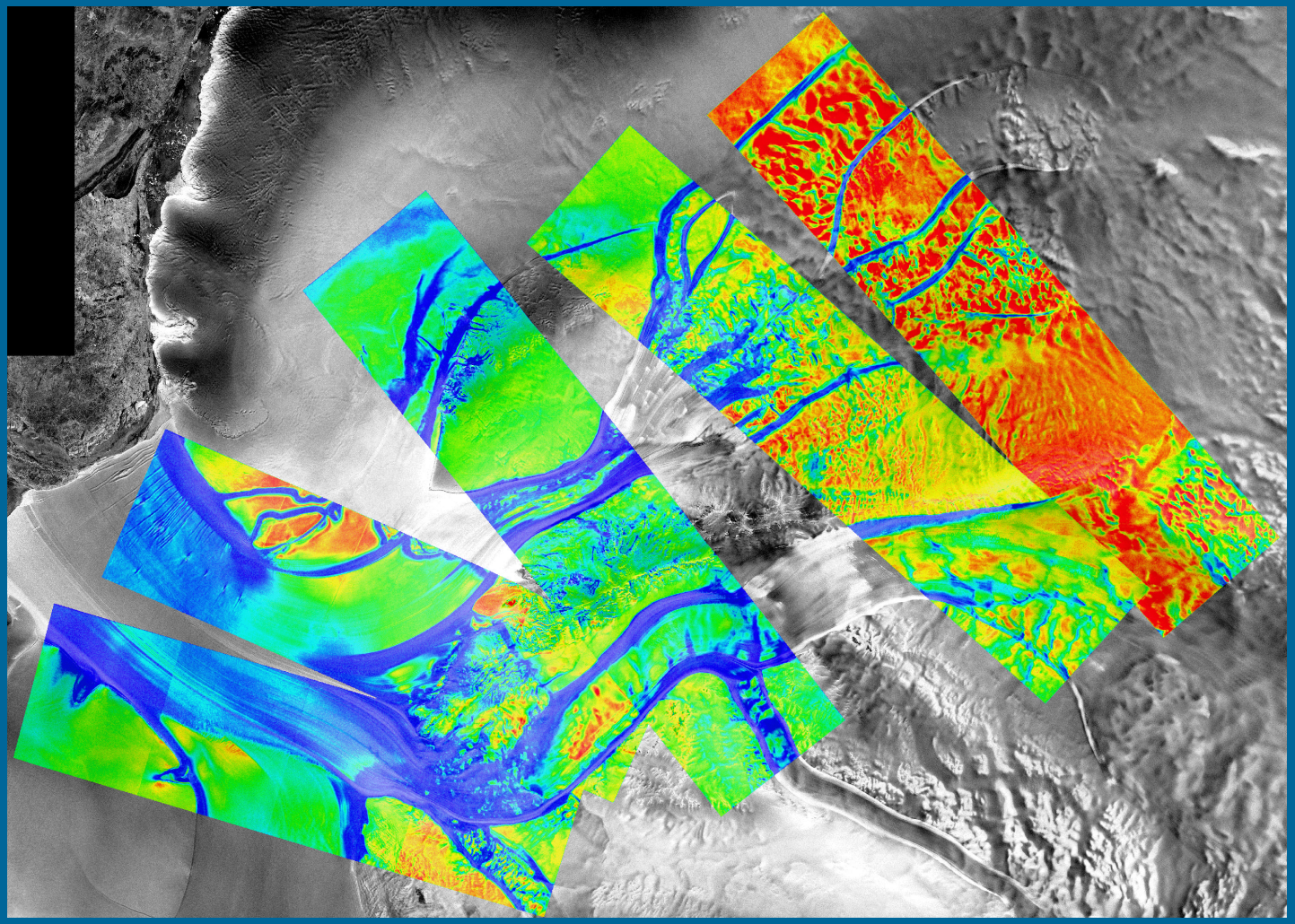
West Antarctic Ice Streams

Interferometry reveals a complex system of tributaries that feed the WAIS



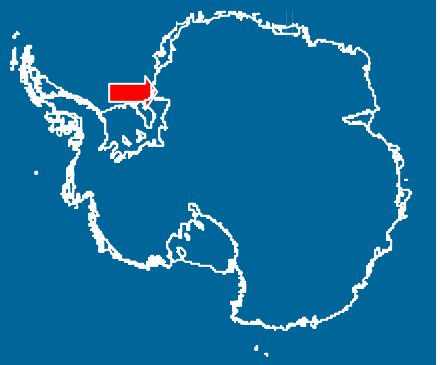
From Joughin and others

1997 InSAR Coherence Map of East Antarctic Ice Streams

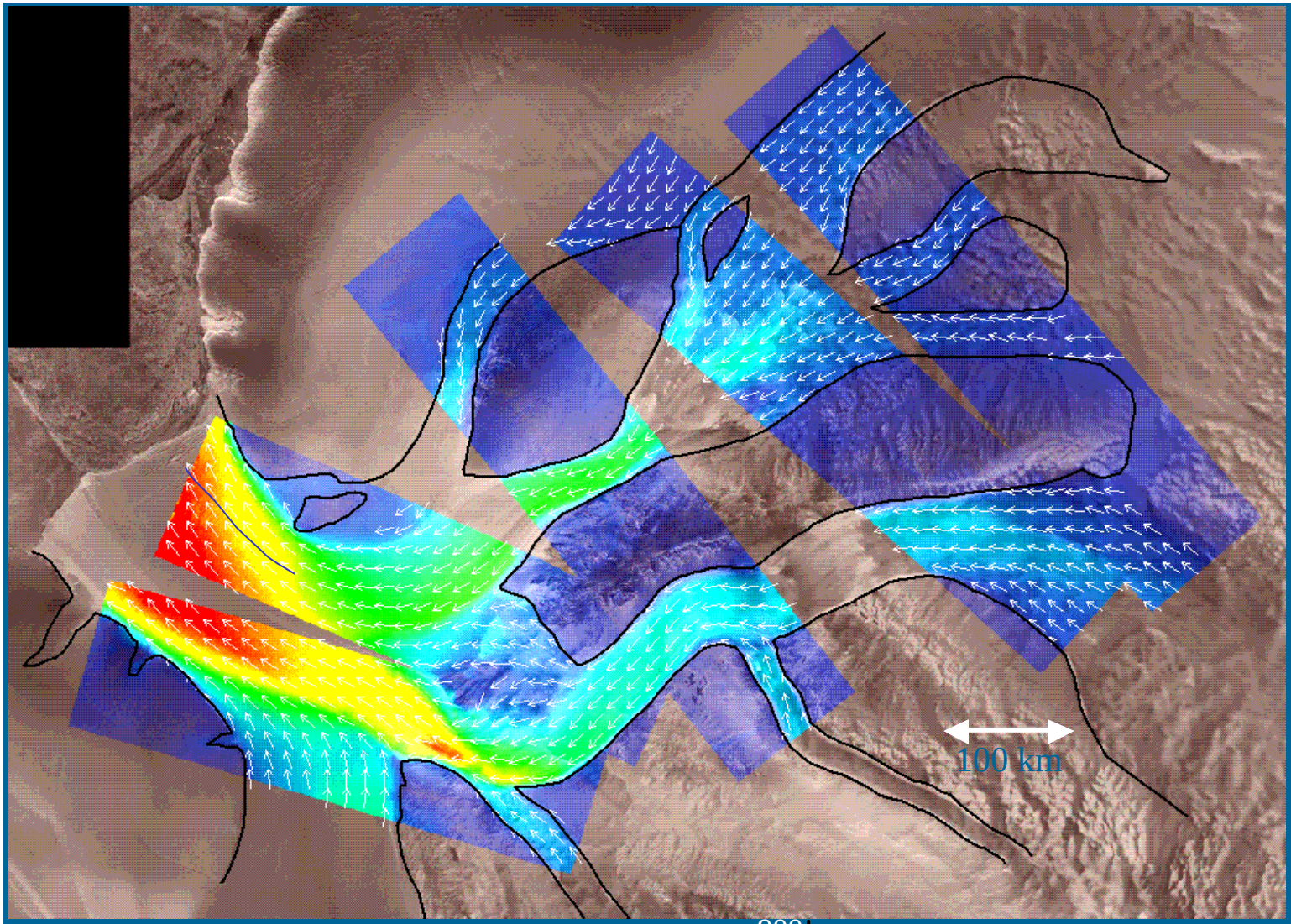


InSAR coherence map reveals the patterns of streaming flow from East Antarctica into the Filchner Ice Shelf.

The extent of these enormous ice streams and the existance of RAMP and Blackwall Glacier was proven with RADARSAT-1

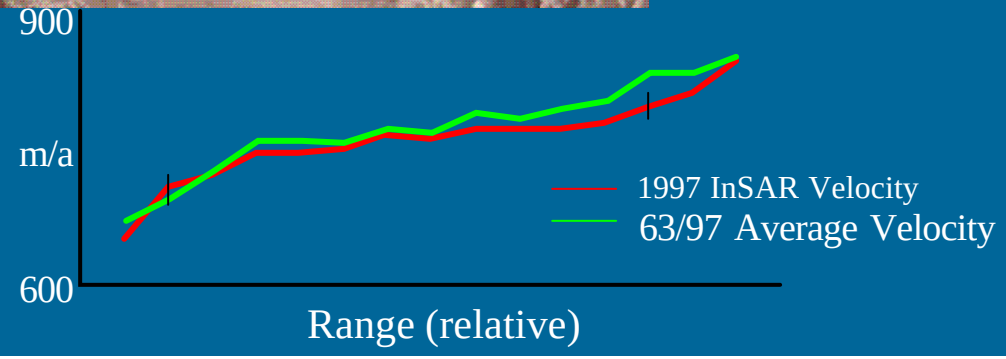


East Antarctic Ice Stream Velocities

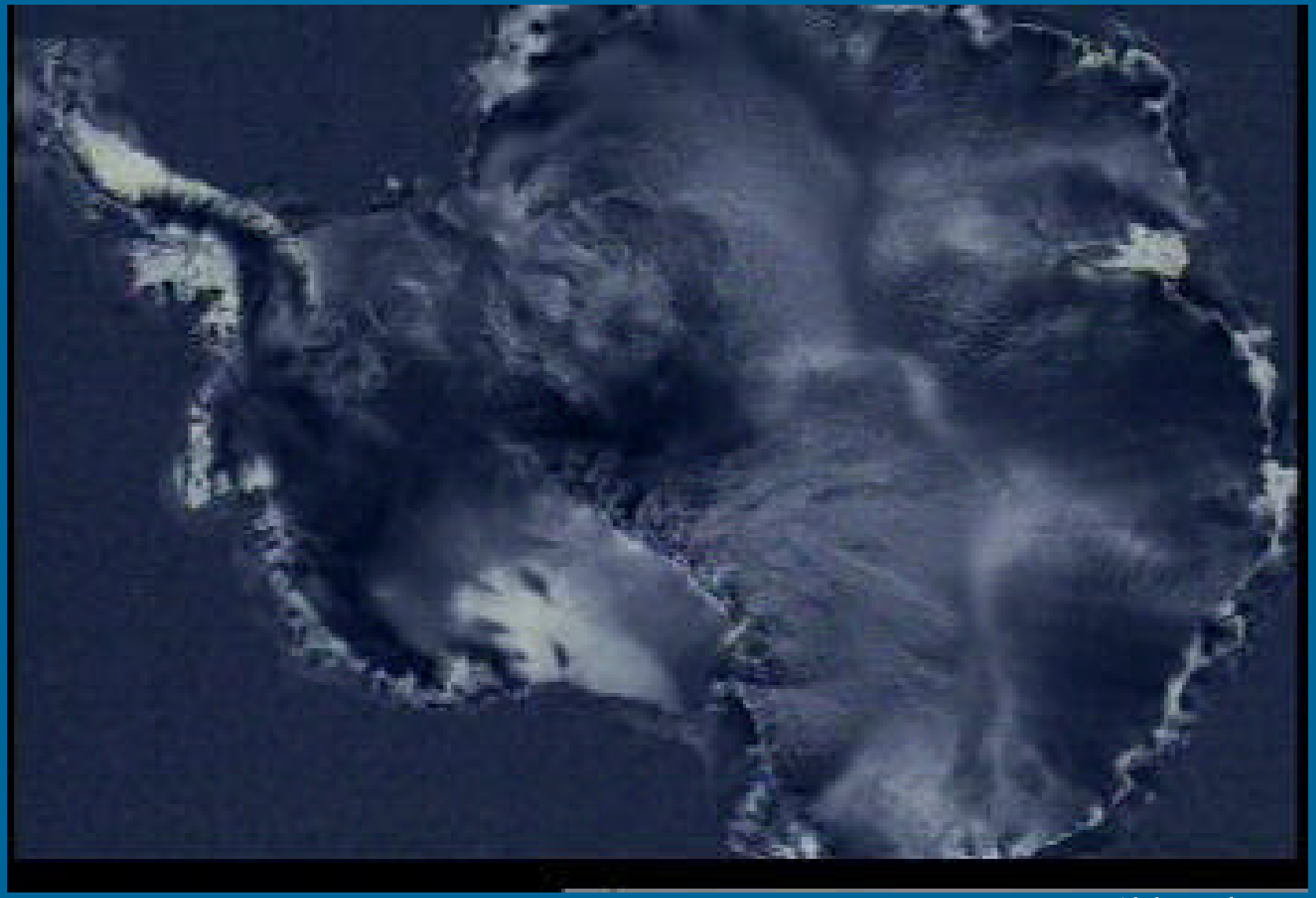


Blue: v< 10m/a
Red: v ~ 1 km/a

The curves show 34 year average and instantaneous velocities on the Filchner Ice Shelf. The period spans formation of huge tabular icebergs



2000 Lambert Glacier Velocities Measured By RADARSAT-1



(click image for animation)

To conclude, a bit of history